



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,244	03/25/2004	Pankaj Gupta	NLMI.P162	6712
30554	7590	11/10/2008	EXAMINER	
SHEMWELL MAHAMEDI LLP Rong Liu 4880 STEVENS CREEK BOULEVARD SUITE 201 SAN JOSE, CA 95129			LOVEL, KIMBERLY M	
ART UNIT	PAPER NUMBER	2167		
MAIL DATE	DELIVERY MODE	11/10/2008	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/809,244	GUPTA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	KIMBERLY LOVEL	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 13 August 2008.

2a) This action is **FINAL**.                            2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 8-16 and 25-28 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 8-16 and 25-28 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All    b) Some \* c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 8/19/2008.

4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_ .

5) Notice of Informal Patent Application

6) Other: \_\_\_\_\_.

**DETAILED ACTION**

***Response to Amendment***

1. This communication is in response to the Amendment filed 13 August 2008.
2. Claims 8-16 and 25-28 are currently pending and claims 1-7 and 17-24 have been canceled. In the Amendment filed 13 August 2008, none of the claims are amended. This action is made Final.
3. The rejections of claims 8-11 and 25-28 as being unpatentable over US Patent No 6,018,524 to Turner et al in view of US Patent No 7,162,481 to Richardson et al have been maintained.

***Information Disclosure Statement***

4. The information disclosure statement (IDS) submitted on 19 August 2008 was filed after the mailing date of the Office Action on 10 July 2008. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**6. Claims 8-11 and 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No 6,018,524 to Turner et al (hereafter Turner) in view of US Patent No 7,162,481 to Richardson et al (hereafter Richardson).**

Referring to claim 8, Turner discloses a method for updating a forwarding database [forwarding table], comprising:

forming a hierarchical tree structure having root, branch and leaf nodes that define (i) at least a minimum number (N/T) of sub-databases of the forwarding database and (ii) respective bit combinations associated with the sub-databases (see column 2, lines 12-13; column 4, lines 50-56; Fig 6; and Fig 7);

modifying the hierarchical tree structure in accordance with one or more update operations [insertion strategy] (see column 14, lines 42-43 and Fig 19); and

updating one or more of the sub-databases to reflect modifications made to the hierarchical tree structure, wherein the one or more updated sub-databases corresponds to only those portions of the hierarchical tree affected by the update operation [incremental algorithm done by doing the Insert algorithm for an individual prefix when a new prefix is added] (see column 17, line 60 – column 18, line 34).

Turner fails to explicitly disclose the further limitation of the tree structure wherein each prefix of the N prefixes is stored within one of the databases having an associated bit combination that matches the corresponding bits within the prefix, wherein each of the sub-databases has no more than a pre-determined number (T) of prefixes, and at least one of the sub-databases includes a plurality of the prefixes. Richardson discloses a multi-bit trie, including the further limitation of the tree structure wherein

each prefix of the N prefixes is stored within one of the databases having an associated bit combination that matches the corresponding bits within the prefix, wherein each of the sub-databases has no more than a pre-determined number (T) of prefixes, and at least one of the sub-databases includes a plurality of the prefixes (see column 4, lines 20-62 and Fig 3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the multi-bit tree structure of Richardson to replace the tree structure of Turner. One would have been motivated to do so in order to improve access speed by utilizing a multi-bit trie (Richardson: see column 1, lines 31-36).

**Referring to claim 9**, the combination of Turner and Richardson (hereafter Turner/Richardson) discloses the method of claim 8, wherein said forming comprises, beginning with a most significant bit of the N number of prefixes, repeatedly splitting the N number of prefixes into a plurality of nodes extending between and including a root node and a plurality of leaf nodes, and wherein each of the plurality of leaf nodes corresponds to one of the sub-databases (Turner: see column 5, lines 41-62 and Fig 7).

**Referring to claim 10**, Turner/Richardson discloses the method of claim 9, wherein said modifying comprises performing the update operations on one or more of the plurality of leaf nodes, wherein the update operations are selected from a group comprising: adding [insertion] a new prefix to the forwarding database, deleting an existing prefix from the forwarding database and modifying an existing prefix in the forwarding database (Turner: see column 14, lines 42-43; column 17, line 60 – column 18, line 34 and Fig 19).

**Referring to claim 11**, Turner/Richardson discloses the method of claim 10, wherein said modifying comprises performing the update operations on one or more of the branch nodes (Turner: see column 14, lines 42-43; column 17, line 60 – column 18, line 34 and Fig 19).

**Referring to claim 25**, Turner discloses a computer-readable storage medium having recorded therein one or more sequences of instructions which, when executed by a processor, cause the processor to update a forwarding database having a number (N) of prefixes, including causing the processor to:

form a hierarchical tree structure having root, branch and leaf nodes that define (i) at least a minimum number (N/T) of sub-databases of the forwarding database and (ii) respective bit combinations associated with the sub-databases (see column 2, lines 12-13; column 4, lines 50-56; Fig 6; and Fig 7);

modify the hierarchical tree structure in accordance with one or more update operations [insertion strategy] (see column 14, lines 42-43 and Fig 19); and

update one or more of the sub-databases to reflect modifications made to the hierarchical tree structure, wherein the one or more updated sub-databases corresponds to only those portions of the hierarchical tree affected by the update operation [incremental algorithm done by doing the Insert algorithm for an individual prefix when a new prefix is added] (see column 17, line 60 – column 18, line 34).

Turner fails to explicitly disclose the further limitation of the tree structure wherein each prefix of the N prefixes is stored within one of the databases having an associated bit combination that matches the corresponding bits within the prefix, wherein each of

the sub-databases has no more than a pre-determined number (T) of prefixes, and at least one of the sub-databases includes a plurality of the prefixes. Richardson discloses a multi-bit trie, including the further limitation of the tree structure wherein each prefix of the N prefixes is stored within one of the databases having an associated bit combination that matches the corresponding bits within the prefix, wherein each of the sub-databases has no more than a pre-determined number (T) of prefixes, and at least one of the sub-databases includes a plurality of the prefixes (see column 4, lines 20-62 and Fig 3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the multi-bit tree structure of Richardson to replace the tree structure of Turner. One would have been motivated to do so in order to improve access speed by utilizing a multi-bit trie (Richardson: see column 1, lines 31-36).

**Referring to claim 26**, Turner/Richardson discloses the computer readable storage medium of claim 25, wherein the computer readable storage medium is directly coupled to, or incorporated within, the processor, and wherein at least a portion of the sub-database at each leaf nodes is contained within the computer readable storage medium (Turner: see column 15, lines 60-62; column 16, lines 1-10 and Fig 14).

**Referring to claim 27**, Turner/Richardson discloses the computer readable storage medium of claim 26, wherein the computer readable storage medium comprises random access memory (Turner: see column 15, lines 60-62; column 16, lines 1-10 and Fig 14).

**Referring to claim 28**, Turner/Richardson discloses the computer readable storage medium of claim 26, wherein, the memory structure comprises one or more of a random access memory, a content-addressable memory, or a network search engine (NSE) (Turner: see column 5, lines 18-31).

**7. Claims 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No 6,018,524 to Turner et al as in view of US Patent 7,162,481 to Richardson et al as applied to claim 10 above, and further in view of US Patent No 6,735,600 to Andreev et al (hereafter Andreev).**

**Referring to claim 12**, Turner/Richardson discloses modifying the tree structure, however, Turner/Richardson fails to explicitly disclose the further limitations of splitting a leaf node or merging a leaf node. Andreev discloses modifying a tree structure by inserting and deleting entries (see abstract and column 3, lines 43-52), including the further limitation wherein said modifying further comprises one or more of the following steps:

splitting into at least one additional pairs of leaf nodes, a leaf node associated with a sub-database to which a new prefix is to be added and which, upon adding the new prefix would contain more than T prefixes (see column 3, lines 52-58); and

merging with a branch node, a leaf node associated with a sub-database which, upon completion of an update operation, would be left with fewer than a predetermined number of prefixes (see column 3, lines 59-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the steps of splitting and merging the nodes of the tree structure as disclosed by Andreev to modify the tree structure if Turner. One would have been motivated to do so in order to decrease the time it takes to update a tree during insertion or deletion since lookup procedures are a major source of bottlenecks in high-performance routers (see Andreev: column 1, lines 25-30).

**Referring to claim 13**, the combination of Turner/Richardson and Andreev (hereafter Turner/Richardson/Andreev) discloses the method of claim 12, wherein said merging is performed: if either

- (i) the total number of sub-databases defined by the hierarchical tree structure would be, absent said merging, greater than a predetermined number; or
- (ii) a predetermined time period has passed, in which no merging was performed (see column 3, lines 54-58; column 4, lines 37-52; and column 7, line 28 – column 8, line 7).

**Referring to claim 14**, Turner/Richardson/Andreev discloses the method of claim 13, wherein said merging further comprises repeatedly merging the leaf node and the branch node up towards the root node if the total number of prefixes within the leaf node, the branch node and any subsequently merged branch nodes remains less than the minimum number of prefixes (see column 7, lines 28 – column 8, line 7).

**Referring to claim 15**, Turner/Richardson/Andreev discloses the method of claim 12, wherein said merging is performed only if no other node exists below the branch node that can be paired with the leaf node, such that the combined number of

prefixes within the leaf node and the other node is greater than T (see column 3, lines 54-58; column 4, lines 37-52; and column 7, line 28 – column 8, line 7).

**Referring to claim 16**, Turner/Richardson/Andreev discloses the method of claim 15, wherein, said merging is performed no more than one time in response to an update operation (see column 3, lines 54-58; column 4, lines 37-52; and column 7, line 28 – column 8, line 7).

### ***Response to Arguments***

8. Applicant's arguments filed 13 August 2008 have been fully considered but they are not persuasive.

9. Referring to applicant's arguments in regards to the rejection of claims 8-11 and 25-28, the applicant states "... applicant submits that no individual data table in Richardson stores an entire prefix."

10. It is noted that the limitation states "wherein each prefix of the N prefixes is stored within one of the sub-databases having an associated bit combination that matches corresponding bits within the prefix." The examiner respectfully disagrees that Richardson fails to teach this limitation. Richardson states that segments of the prefixes are stored in each of the sub-databases. A segment of a prefix, even if it is a portion of a prefix, is still a prefix. Furthermore, the claim language fails to explicitly state that an entire prefix is stored in one sub-database with emphasis on the concept of no portions of the prefix be stored in a different sub-database. Therefore, given the broadest

reasonable interpretation of the claim language, Richardson is considered to teach the concept of storing a prefix in a sub-database.

11. Referring to applicant's arguments on pages 7-8 of the Remarks in regards to the rejections of dependent claims 12-16, the rejections are maintained for the reasons stated above in regards to independent claim 8.

***Conclusion***

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KIMBERLY LOVEL whose telephone number is (571)272-2750. The examiner can normally be reached on 8:00 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John R. Cottingham/  
Supervisory Patent Examiner, Art Unit 2167

Kimberly Lovel  
Examiner  
Art Unit 2167

7 November 2008  
/K. L./